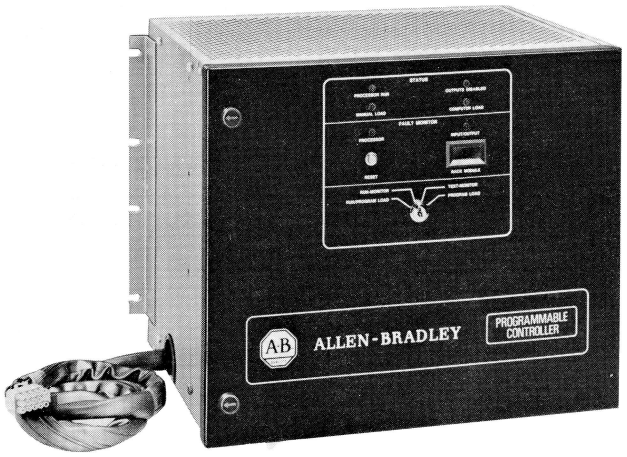
PLC PROCESSOR
Cat. No. 1774-LP3, -RP3, -RP4



DESCRIPTION

The PLC Processor (Cat. No. 1774-LP3, -RP3, -RP4) is the processing unit and memory of the Bulletin 1774 PLC programmable controller. The Processor examines data received from input devices wired into the input/output (I/O) structure, compares this data to the user-written control program, and generates the logic commands which, through input and output modules, monitor and control a wide variety of user-supplied output devices. Through internal diagnostic checks, the Processor monitors the status of the PLC controller, giving appropriate visual signals should certain internal malfunctions occur. A user control program may be written for applications that take full advantage of internally based timing, counting, data transfer and data comparison (such as "less than," "equal to") functions.

The basic Processor must contain two control processing modules, at least one memory module, and one module which accepts and distributes input/output signals from the I/O system. In addition to these basic modules, optional modules are available to perform 4-function arithmetic (+, –, x, ÷), data handling and report generation functions, and interfacing with a variety of peripheral RS-232-C compatible devices.

FEATURES

The PLC Processor contains many basic operating features, and, with additional components, optional capabilities. Together, these features include:

- User-selected variable-size Data Table (256, 512, 1024 words)
- Up to 12K memory in 4K increments
- Internal diagnostics
- Diagnostic indicators on modules
- Operation status indicators on front Control Panel
- 11-Module Processor Chassis
- RS-232-C Interfacing (Programming Panel, Teletypewriters and tape punches, data terminals, computers)
- Conditional Ignore Programming
- Individual Contact Histogram (optional)
- 4-function Arithmetic (optional)
- Data handling, report generation, operator communication (optional)

Basic features are covered in this Publication. (An Index is placed on page 2.) Optional capabilities are discussed in the appropriate product data sheets available from Allen-Bradley, and instruction manuals, supplied with the units.

Material presented in this Publication follows a general plan: where possible, features and related hardware are discussed together. Certain other features require individual treatment.

Note that during the first quarter of 1978 a Processor with enhanced features was introduced. [1] Material in this Publication is based on this version of the Processor.

SPECIFICATIONS

Input Voltages
(Supplied by Local Power Supply)
+5, +15,–15V DC

Execution Time (nominal)
5 msec/1K words (1 Memory Module) [1]
2.5 msec/1K words (2 or 3 Memory Modules)

Memory Size
12K (max.)
in 4K increments

PLC "Word" Length
16 data bits plus 2 parity bits
1 parity bit per byte (a byte = 8 bits)

Data Tables [2]
address:
256 Data Table 000–377
512 Data Table 000–777
1024 Data Table 000-1777

Shock Rating
15g peak
1/2 cycle sine wave acceleration

Vibration Rating
Linear sawtooth 0-60 Hz-0
duration 1 minute
intensity 0.1 inch peak to peak or
±3g (whichever is greater)

Dimensions (W x H x D)
19.0 x 14.5 x 13.75 in.
48.3 x 36.8 x 34.9 cm.

Weight: Basic Processor [3]
50 lbs. (22.68 kg.)

[1] Refer to Table C, page 10
[2] Refer to Figure 3
[3] Basic Processor specified in Paragraph with same title

[1] The Processors supplied after March, 1978, have several enhanced features, and therefore new Catalog Numbers. Included in these features is the expansion of the number of Processor-related modules (to 11 from 8) which can be located in the Processor Chassis (Cat. No. 1774-LA2) and the expansion of the Data Table size to 1024 words through appropriate switch selection.

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MODULES

The Processor Chassis (Cat. No. 1774-LA2) provides slots for simultaneous use of all Processor Modules, both basic and optional, for **either** a Local or Remote I/O PLC system. Furthermore, the Processor allows for the addition of a second or third Memory Module, thereby optionally expanding the maximum memory capability to 8K or 12K words **without** modification to the basic chassis. (Other capabilities are discussed throughout this Publication.)

The modules which may be used in this Processor Chassis are the following:

- Program Panel Interface Module (Cat. No. 1774-TB2)
- Data Handling Module (Cat. No. 1774-DH2) **or** Protected Logic Module (Cat. No. 1774-DL2)
- Computer Interface Module (Cat. No. 1774-CI2)
- Arithmetic (Cat. No. 1774-DL2)
- Local I/O Scanner Module (Cat. No. 1774-SL), **or** 1 or 2 Remote I/O Half-Scanner Module(s) with 5000-foot capability (Cat. No. 1774-SR)
- Processor Module No. 1 (Cat. No. 1774-LB2)
- Processor Module No. 2 (Cat. No. 1774-LC2)
- Memory Module (Cat. No. 1774-MA): 1, 2, or 3 Modules

Table A
INCLUSIVE PROCESSOR MODULE/Cat. No. LIST

MODULE	ENHANCED Cat. No.	SUPERSEDED Cat. No.
Processor Module No. 1	1774-LB2	1774-LB
Processor Module No. 2	1774-LC2	1774-LC
Program Panel Interface	1774-TB2	1774-TB
Computer Interface	1774-CI2	1774-CI
Data Handling	1774-DH2	1774-DH
Protected Logic	1774-DL2	1774-DL
Arithmetic	1774-LD2	1774-LD
Memory	1774-MA	unchanged
Local I/O Scanner	1774-SL	unchanged
Remote I/O Scanner (5000 cable-feet capability)	1774-SR	unchanged
Processor Chassis	1774-LA2	1774-LA

Refer to Figure 1 which shows the slot assignment configuration for Processor modules.

Note that each individual type of module, enhanced or superseded, has the same basic Catalog Number, but the suffix 2 was added to enhanced modules in order to distinguish them from earlier versions. Table A contains Catalog Numbers for all existing Processor modules. Note that Catalog Numbers for the Memory Module, Local I/O Scanner, and Remote I/O Half-Scanner Module (5000 cable-feet capability) have not changed. Refer also to Table B for a complete listing of Processor Catalog Numbers, both current and superseded.

Table B
INCLUSIVE PROCESSOR CATALOG NUMBERS

PROCESSOR	ENHANCED Cat. No.	SUPERSEDED Cat. No.
Local	1774-LP3	1774-LP1 1774-LP2
Remote (5000 cable-feet capability)	1774-RP3	1774-RP1 1774-RP2
Remote [1] (10,000 cable-feet capability)	1774-RP4	Use above and order optional components separately.

[1] Not currently available; Cat. No. for reference purposes only.

Basic Processor Modules – The basic Processor contains several modules necessary for basic operation. These are:

- Processor Module No. 1
- Processor Module No. 2
- I/O Scanner Module, Local or Remote I/O Half-Scanner Module (5000 cable-feet capability)
- Memory Module

A discussion of the basic modules is presented in the following paragraphs.

Memory Module – Each Memory Module (Cat. No. 1774-MA) has the capacity to store 4096 (4K) words of information. Within one PLC system, Local or Remote, a maximum of 3 Memory Modules can be used. This optionally expands the memory capacity, in 4K increments, from 4096, thru 8192, to a maximum of 12,288 words for both the Data Table and user program. Memory Modules **must** be inserted beginning with Slot No. 10, the first slot to the right of the Processor Module No. 2 (Cat. No. 1774-LC2). Additional Modules continue to the right without leaving empty slots.

Processor Module No. 1 – Processor Module No. 1 (Cat. No. 1774-LB2) occupies slot No. 6 in the Processor Chassis. It contains the integrated circuit logic that generates the memory clock, program counter, interrupt logic, decision logic and test logic, and Processor diagnostics. On it, the selection of the Data Table size is made. (Refer to Figure 2.)

The Data Table capacities available are 256_{10}, 512_{10}, or 1024_{10} words which the user chooses, through switch selection, according to the size best suited to the needs of his application. User program instructions are, consequently, stored after word address 377_8, 777_8, or 1777_8 respectively, depending on the Data Table size set. (Refer to Figure 3.)

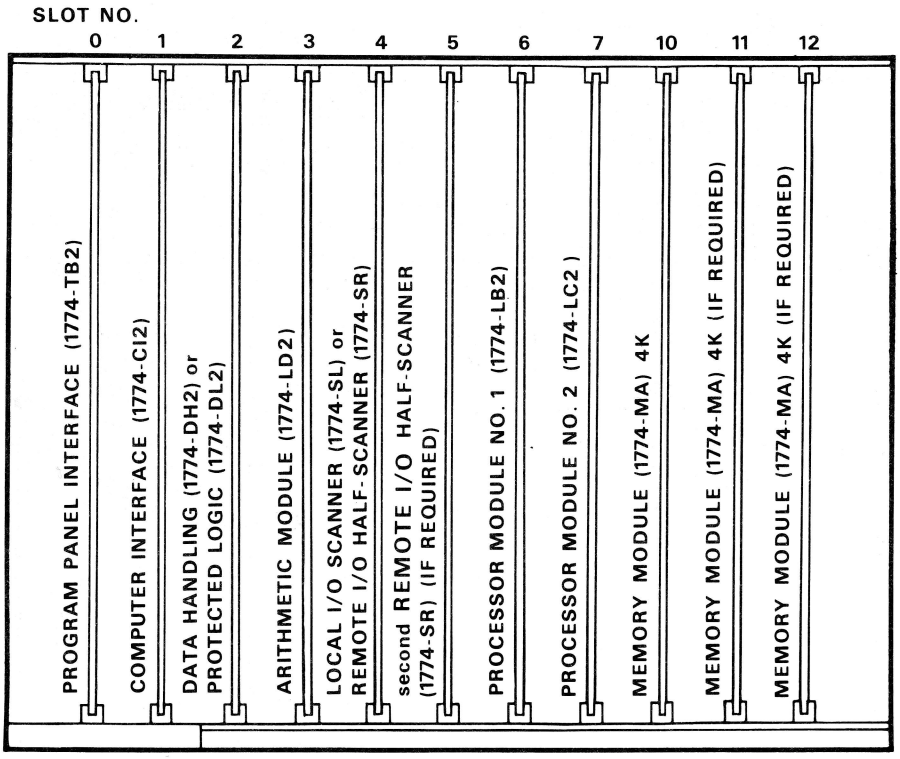

Figure 1 — Processor Module Slot Assignments

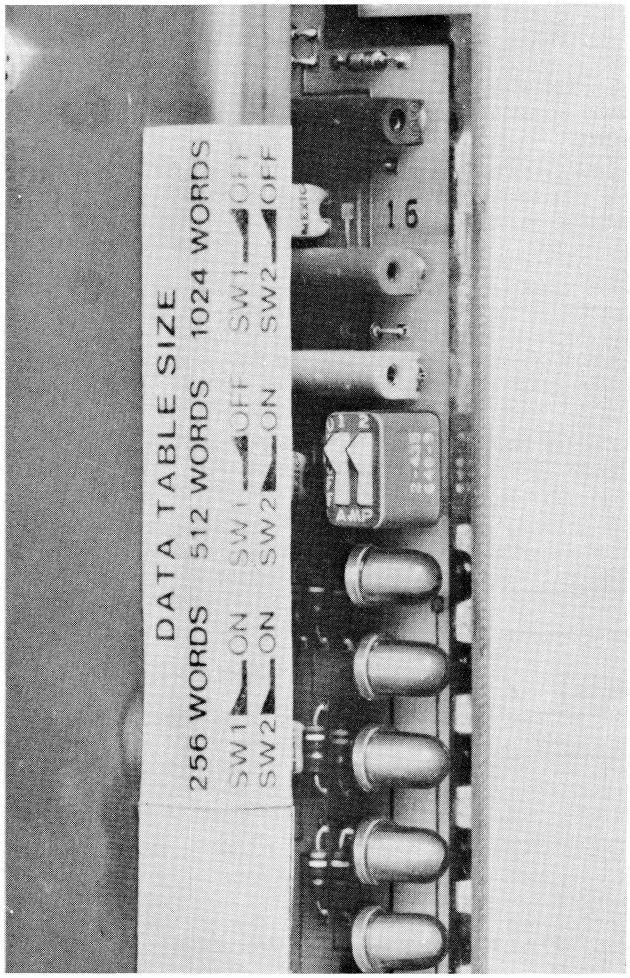

Figure 2 — Data Table Switch

Note: The size of the Data Table chosen may be shown on the Program Panel screen by entering keyboard commands that display the START message.

The settings of 2 rocker switches on a switch assembly located near the front of the Processor Module No. 1 (Cat. No. 1774-LB2) determine the Data Table size. Switch settings for the 3 Data Table sizes are shown in Figure 4. Switch positions must be set **before** user program steps are entered.

CAUTION: Do not change the settings after a program is loaded into memory since the Processor determines the location of the beginning of the user program based on the current switch setting. Part of the user program may not be scanned by the Processor if the switch positions are changed after program entry.

New nomenclature has been established for the different size Data Tables. PLC literature now refers to the 256 Data Table (previously the Normal Data Table), the 512 Data Table (previously the Expanded, or "Upper," Data Table), and the 1024 Data Table. (References to the Normal and Expanded Data Tables are no longer made.)

All PLC programming Instructions may directly reference any word of the 256 Data Table. Certain PLC Instructions can reference only the first 256 words in the Data Table when a 512 or 1024 word Data Table is selected.

Data Transfer Instructions (GET, PUT), Data Comparison Instructions (LES, EQU), Arithmetic Instructions (+, –, x, ÷), and Counter Instructions (CTU, CTD, CTR) can directly reference **any** word in the Data Table, except 377_8, regardless of the size selected. (Refer to Figure 5.) However, indirect programming techniques are used to examine counter and arithmetic status bits beyond word address 376.

Examine ([ ]), Timer ([TON], [TOF], [RTO], [RTR]), and Control Instructions ([ ], [ ], [ ], [ ]) directly reference the first 256 words of the Data Table. When the 512 or 1024 Data Table is switch-selected, these functions are manipulated through an in-

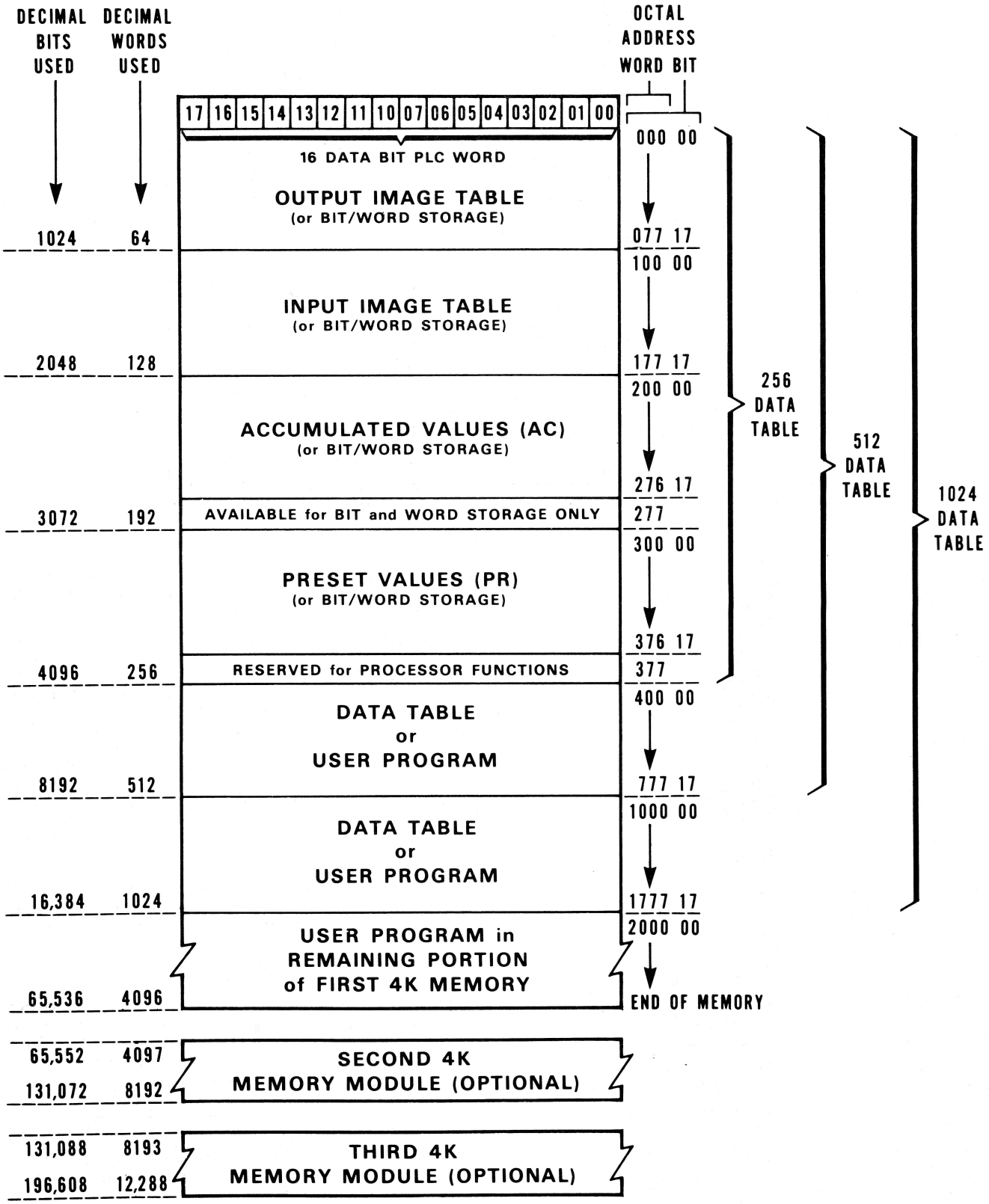

Figure 3 — PLC Memory Organization with Cat. No. 1774-LP3, -RP3, and -RP4 Processors

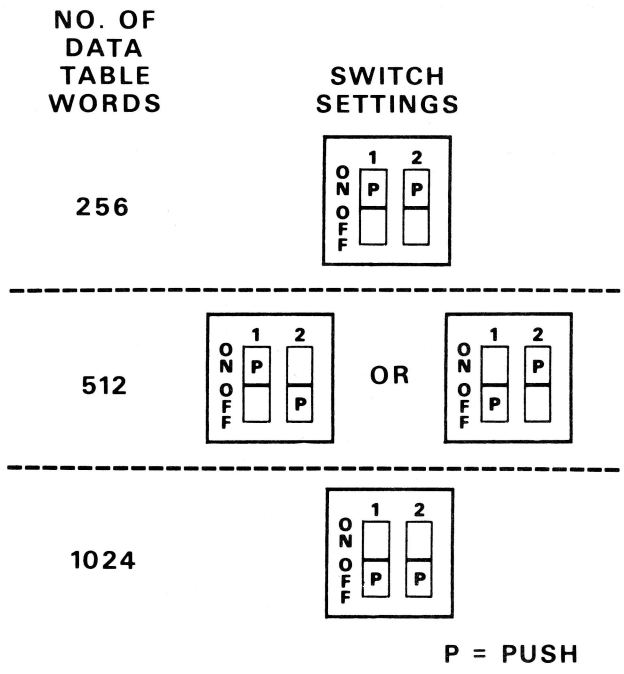

Figure 4 — Data Table Size Selection; Front Edge of Processor Module No. 1

termediate word address. This is accomplished by transferring data from the word address in those Data Table areas to an unused word address in the 256 Data Table. (That is, from a location **after** 377_8 to one **between** 000_8 and 376_8.) At that time, the required manipulation can be performed. The data is then transferred back into the word address larger than 377_8.

An example of the indirect programming technique is shown in Figure 6. A "desired program," which in reality requires indirect programming techniques, is shown at the top. The actual technique begins at Rung No. 1, which transfers the word from address 1410_8 into the 256 Data Table location 375_8. (In this example, it is assumed that 375_8 is not used for Preset Values and therefore is available for word storage.) Rung No. 2 is similar, but with a different word. Rung No. 3 shows the bit manipulation. Rung No. 4 transfers the manipulated word back into the address larger than 377_8.

A discussion of indicators on Processor Module No. 1 is included at the end of this Publication.

Processor Module No. 2 — The Processor Module No. 2 (Cat. No. 1774-LC2) is the second of two printed circuit modules that actually carry on the PLC Processor functions. This Module occupies slot No. 7 in the Processor Chassis.

Processor Module No. 2 contains the integrated circuit logic for PLC Instructions and Processor diagnostics. (The only data that is programmed into memory is the actual user program.)

I/O Scanner Modules — I/O Scanner Modules control the data transfer between the PLC Processor and the I/O Racks and perform diagnostic functions. They address each Rack and each module of that Rack. Communication in the Local I/O PLC system is a parallel data transfer operation. Data is transferred by interrupting the Processor and feeding data into, or taking data from, the Data Table.

For a Local I/O PLC system, the Local I/O Scanner Module (Cat. No. 1774-SL) is used. It occupies slot No. 4 in the Processor Chassis. For a Remote I/O PLC system a Remote I/O Half-Scanner Module (Cat. No. 1774-SR) is used. Note that Remote I/O PLC systems larger than 4 Remote I/O Racks require 2 Remote I/O Half-Scanner Modules. (Place the second Module in slot No. 5.)

The Remote I/O Half-Scanner Module communicates with the I/O Racks through the Remote I/O Distribution Panel

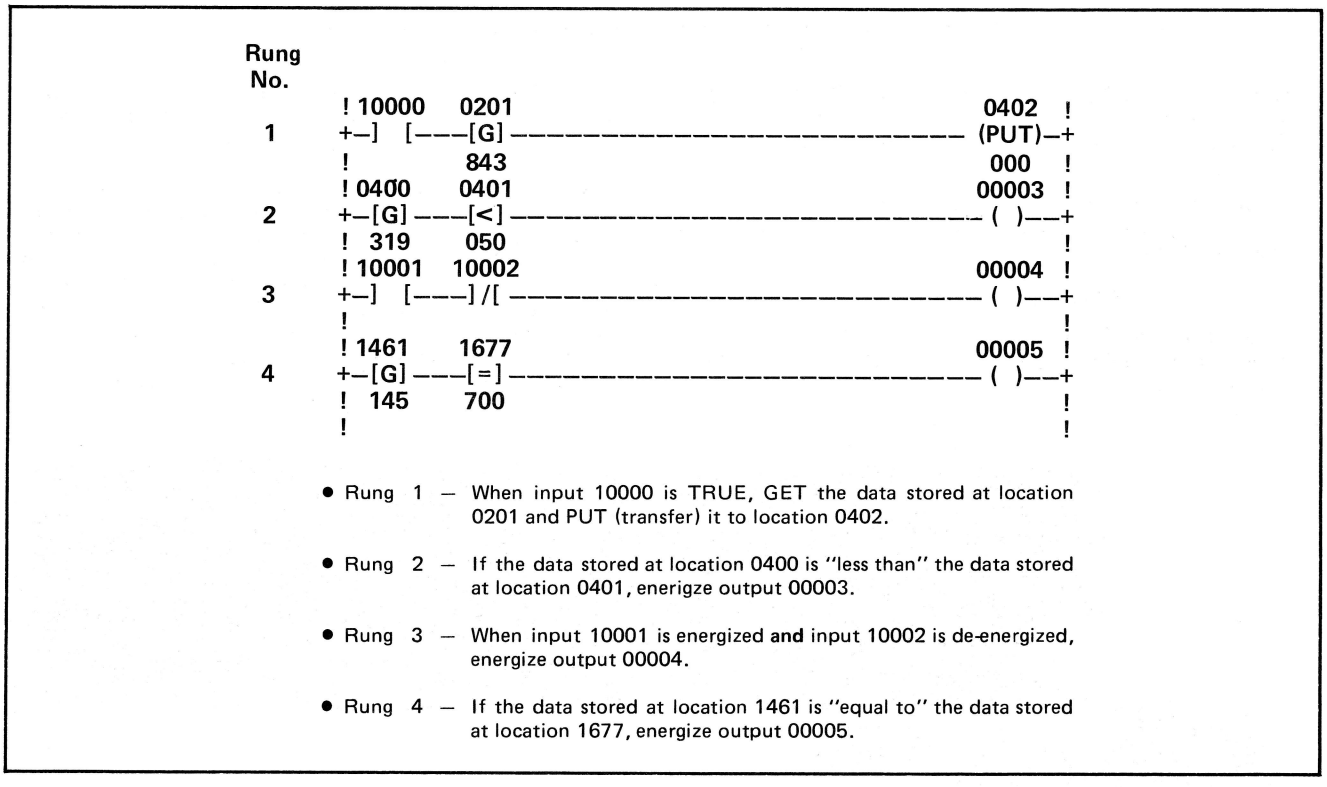
Rung No.
1
2
3
4
10000
0201
0402
(PUT)
843
000
0400
0401
00003
319
050
10001
10002
00004
1461
1677
00005
145
700
• Rung 1 — When input 10000 is TRUE, GET the data stored at location 0201 and PUT (transfer) it to location 0402.
• Rung 2 — If the data stored at location 0400 is "less than" the data stored at location 0401, enerigze output 00003.
• Rung 3 — When input 10001 is energized and input 10002 is de-energized, energize output 00004.
• Rung 4 — If the data stored at location 1461 is "equal to" the data stored at location 1677, energize output 00005.

Figure 5 — Direct Programming of GET, PUT, LES, EQU Instructions in the 1024 Data Table

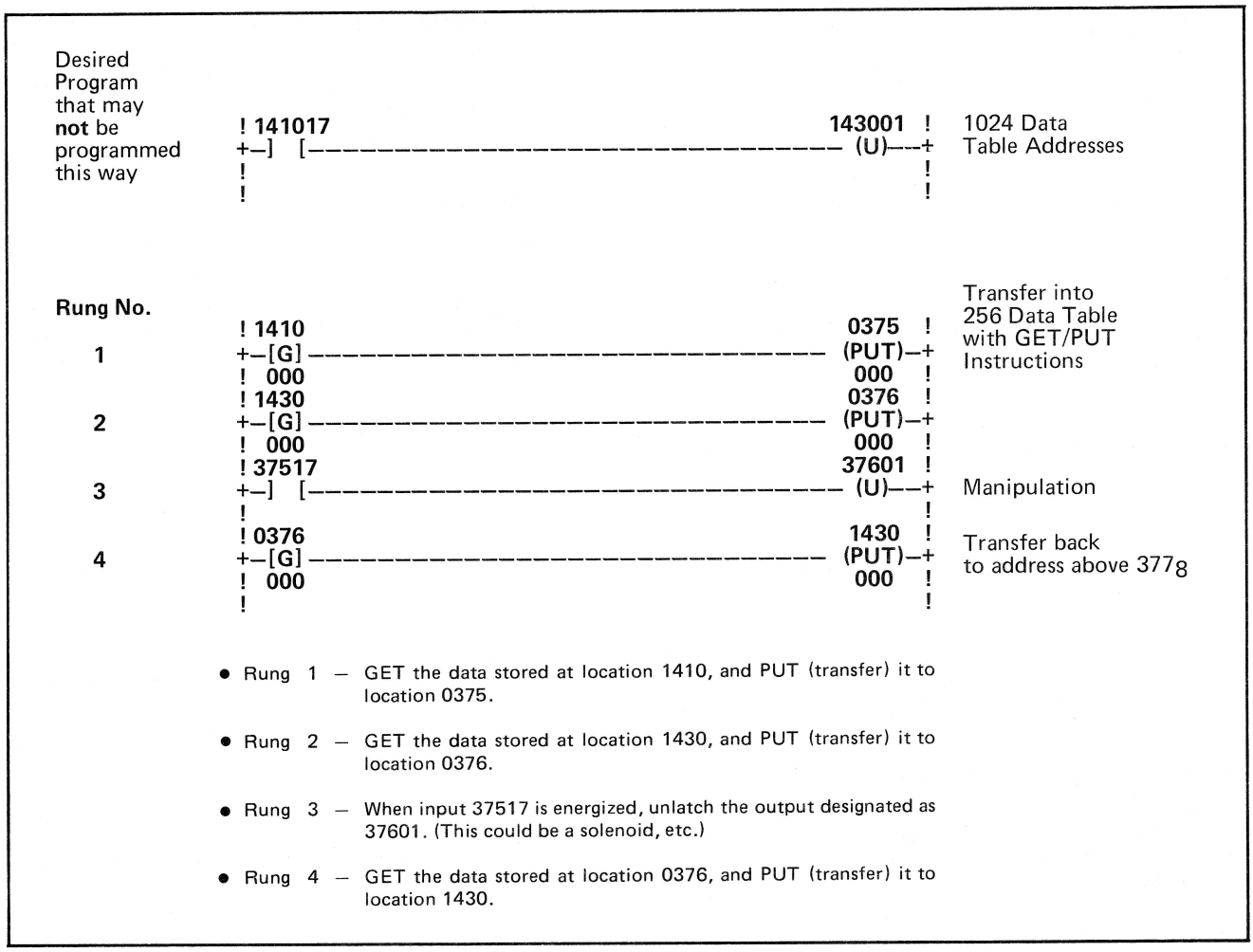
Desired Program that may **not** be programmed this way
! 141017
+–] [–––––––––––––––––––––––––––––––– 143001 !
(U)–––+
1024 Data Table Addresses
Rung No.
1
! 1410
+–[G]––––––––––––––––––––––––––––––– 0375 !
(PUT)–+
! 000 000 !
2
! 1430
+–[G]––––––––––––––––––––––––––––––– 0376 !
(PUT)–+
! 000 000 !
3
! 37517
+–] [–––––––––––––––––––––––––––––––– 37601 !
(U)–––+
Manipulation
4
! 0376
+–[G]––––––––––––––––––––––––––––––– 1430 !
(PUT)–+
! 000 000 !
Transfer into 256 Data Table with GET/PUT Instructions
Transfer back to address above 377₈
• Rung 1 – GET the data stored at location 1410, and PUT (transfer) it to location 0375.
• Rung 2 – GET the data stored at location 1430, and PUT (transfer) it to location 0376.
• Rung 3 – When input 37517 is energized, unlatch the output designated as 37601. (This could be a solenoid, etc.)
• Rung 4 – GET the data stored at location 0376, and PUT (transfer) it to location 1430.

Figure 6 – Indirect Programming Technique Using 1024 Data Table

(Cat. No. 1774-SD). (Refer to Figure 7.) Data transmission between the Remote I/O Racks and the Remote I/O Half-Scanner Module is a serial data transfer operation.

Optional Processor Modules – Information on the optional Processor modules is presented in product data sheets for individual modules.

FEATURES EXPLANATIONS

In addition to the features explained thus far, several others are available. One is resident in the basic Processor; two others are available with the addition of optional modules.

Basic Features – Basic features are those that are inherent to the basic PLC Processor. Conditional Ignore is one such feature.

Conditional Ignore – By using Conditional Ignore programming techniques, groups of rungs in the program located within a user-selected zone can be either conditionally ignored or enabled by the Processor. When ignored, the program scan continues to step through each instruction in this zone, but the states of the Data Table bits or words addressed by the output instructions are **not** changed. When enabled, normal operation of the system continues according to the logic in the zone. (Refer to Figure 7.)

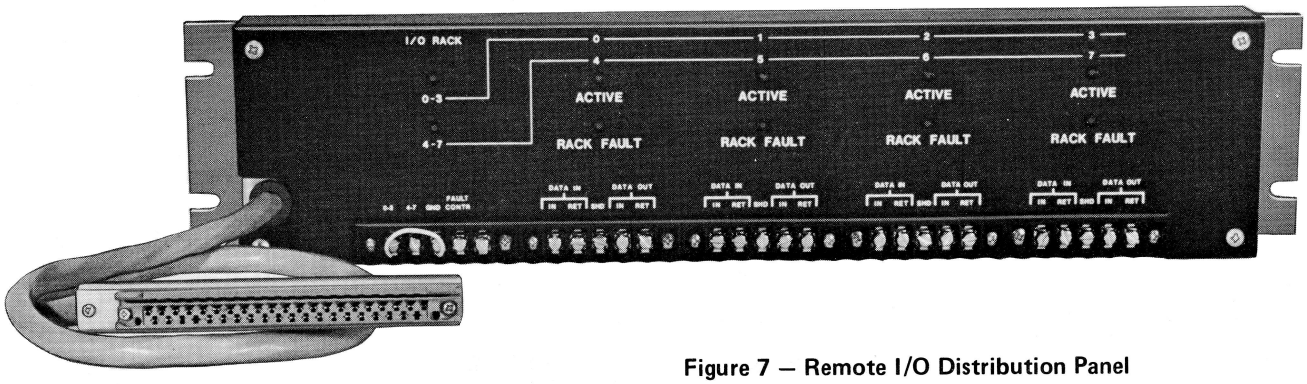

Figure 7 – Remote I/O Distribution Panel

Instructions **outside** the bounds of a particular Conditional Ignore Zone function independently of the Zone's state.

The Conditional Ignore feature may be applied in a variety of ways. One use allows quick change-over of a machine or process operation **without** loading an entirely different user program into memory. For example, two different parts can be machined at the same station, but at different times. However, the machining done to each part is different.

Use of the Conditional Ignore feature allows one user program to be written for **both** parts and stored in memory. The same machine outputs, which must function in differing sequences according to differing part specifications, are programmed in two Conditional Ignore Zones. However, only **one** of these two Conditional Ignore Zones can be enabled at **one** time, because the preconditions for the Start of Zone Rungs are mutually exclusive. (The change-over may be initiated by the operator, through limit switches, or by programmed PLC counters.)

The Conditional Ignore Zone function may also be used to simplify and/or shorten the user's PLC program. Conditional Ignore Zones can sequentially enable user-selected program functions. Some examples of this type of programming technique include, but are not limited to, the following:

- **Stepping-Switch Replacement** – The stepping sequence is controlled by comparisons with the Accumulated Value of either a timer or counter. The Data Comparison Instructions are programmed in the Start of Zone Rungs for the Conditional Ignore Zones which control individual steps. (This requires fewer PLC program instructions than programming the Data Comparison Instructions in each rung of every step.)
- **Shift Registers** – This is similar to stepping-switch replacement. The difference is that each step in a shift register is initiated by completion of the previous step, instead of an Accumulated Value comparison.
- **Arithmetic Subroutine** – If several complex yet **identical** arithmetic routines are required, the programming can be simplified with Conditional Ignore Zones. The Arithmetic rungs need only be programmed **once** because Data Manipulation Instructions within counter-sequenced Conditional Ignore Zones are used to share the arithmetic rungs. The counter is incremented at the completion of each Conditional Ignore Zone.

The Conditional Ignore feature, whether used with Local or Remote I/O controller programs, is utilized in the form of Conditional Ignore Zones. Each Zone begins with a Start of Conditional Zone Rung, and ends with an End of Conditional Zone Rung.

The Start of Conditional Zone Rung contains all the user-programmed instructions used to control a Latch Instruction (-Ⓛ-) with the 5-digit address of 37710 on the **same** rung. These instructions which precondition the Latch Instruction may be Examine Instructions (-| |- or -|/|-). They may also be Data Comparison rungs (-[G] - [<]- or -[G] - [=]-). When the preconditioning instructions are logically TRUE, all outputs of the Zone function according to the logic in this user programmed Zone.

By contrast, should the logic of the preconditioning instructions in the Start of Zone Rung become logically FALSE all the rungs in this Conditional Ignore Zone are "ignored" by the Processor.

The End of Conditional Zone Rung is a single output instruction with no preconditioning instructions. It is an Unlatch Instruction (-Ⓤ-) with the 5-digit address 37710.

Note: There are certain qualifications that must be made when the arithmetic function or the Remote I/O programming techniques are being carried out in conjunction with the Conditional Ignore feature. (These are described in appropriate documents.)

Optional Features – Optional features include:

- Arithmetic Capability
- Contact Histogram

Arithmetic Capability – The Processors have 4-function arithmetic capability (+, -, x, ÷) for 3-digit integer numbers if the optional Arithmetic Module (Cat. No. 1774-LD2) is used. Arithmetic Instructions can directly access word addresses up to 1777_8. PLC programming techniques allow for addition, subtraction and multiplication functions to be performed on 6-digit integer numbers. (Refer to the PLC Programming and Operation Manual and the Arithmetic Module data sheet for specific information concerning the Arithmetic Option.)

Note that it is necessary to use a Cat. No. 1774-TB2 Program Panel Interface Module with the Cat. No. 1774-LD2 Arithmetic Module to program arithmetic functions in the enhanced Processor. However, either the Series B or C Program Panel (Cat. No. 1774-TA or -TH) may be used to make the actual entry.

Contact Histogram – The Contact Histogram feature allows a user to obtain a visual display of the status changes (ON/OFF) for an individual Data Table bit (or element) under near real-time operating conditions when the Program Panel Interface Module (Cat. No. 1774-TB2), any Series Program Panel (Cat. No. 1774-TA or -TH), and all cables are properly connected. This feature provides a convenient means for:

- Troubleshooting intermittent inputs and outputs
- Obtaining machine cycle times
- Assisting machine setup and debugging activities
- Overnight system monitoring
- Cam switch adjustments
- Timing of individual inputs or outputs for ON or OFF conditions

The Contact Histogram, as a feature, originates in a program stored in the circuitry of the Program Panel Interface Module (Cat. No. 1774-TB2) and operates as the result of certain keyboard commands from any series of Program Panel (Cat. No. 1774-TA or -TH). With the use of this option, a user can obtain a "case history" of the time, in 100ths of a second, a specific Data Table bit (or element) has been ON or OFF. (Refer to Figure 8.) This can be done with the Processor's Mode Select Switch in any mode for the [| |] instruction, or with this Switch in either the TEST-MONITOR or RUN-MONITOR position for these instructions: [|/|], [-Ⓞ-], [-Ⓛ-], [CTU], [CTD], [TON], [TOF], and [RTO].

An input terminal can be monitored in this fashion, even if its Input Image Table bit is not actually examined in the user program, as may be the case.

An individual Data Table bit may be visually monitored on the Program Panel after a definite keying sequence is entered on the keyboard. Each time the bit changes state, the time elapsed since the previous change in state is shown on the Program Panel display screen. Up to thirty-one elapsed-time displays may be shown on the Program Panel.

There are two modes of operation:

- Automatic Display
- Manual Display

The Manual Display mode is used to hold ("freeze") the first 31 changes of state of the histogram on the CRT screen. In order to continue or to update the display, the [DISPLAY] key on the Program Panel must be pressed.

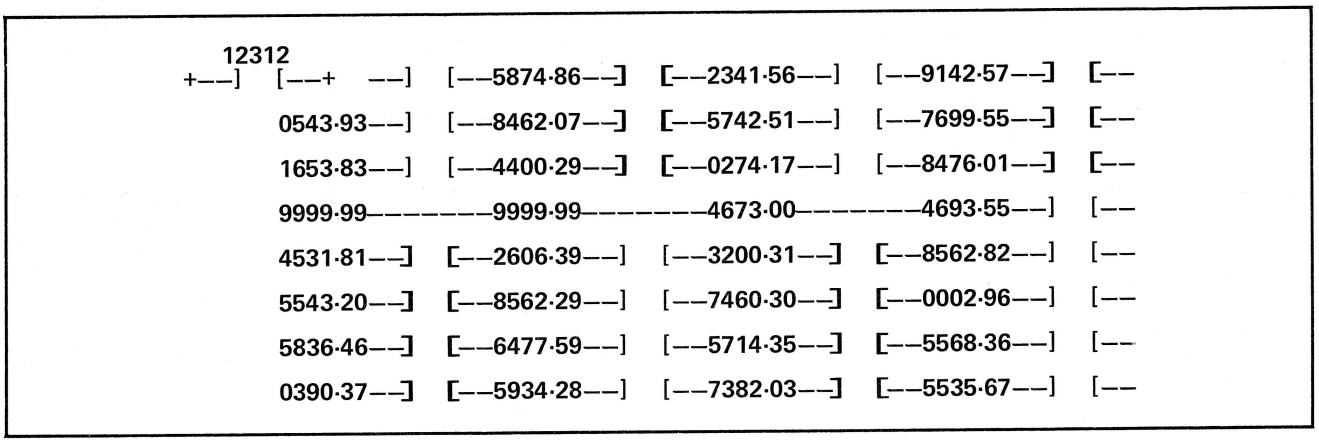

Figure 8 – Typical Contact Histogram Display

The Automatic Display mode allows the Contact Histogram to run continuously, even after the 31-display limitation is reached. If this mode is selected, the display clears itself automatically, and the element's history continues on from the top of the display.

A simple Program Panel command clears the display screen and restores the ladder diagram rung that had been previously displayed. Refer to the PLC Programming and Operation Manual for additional information on the flexibility of the Contact Histogram feature.

PROGRAMMING CONCEPTS

Programming of Examine ([ ]), Bit Control ([ ]), and Timer Instructions ([TON], [TOF], [RTO], [RTR]) is accomplished in the same manner as outlined in the Programming and Operations Manual.

Since Examine and Bit Control Instructions cannot directly access addresses beyond 377_8, they should not be assigned to addresses from 400_8 thru 1777_8. (Refer to Figure 3.) In order to examine the status (ON/OFF) of Data Table bits in these addresses, indirect programming techniques are used. (Refer to Figure 6.)

When the 256 Data Table is selected, Accumulated Values of Timer or Counter Instructions are given 3-digit addresses from 200_8 thru 276_8. Preset Values of these Instructions are given addresses from 300_8 thru 376_8, each of which is exactly 100_8 above Accumulated Values. (Refer to Figure 3.)

Timer Instructions **cannot** be assigned to addresses from 377_8 thru 1777_8 regardless of the Data Table selection.

Counter Instructions, by contrast, may be assigned to addresses from 400_8 thru 1777_8, or in the 512 or 1024 Data Table.

When the 512 Data Table is selected, the Accumulated Values of Counter Instructions may also be given 3-digit addresses from 400_8 thru 477_8 and from 600_8 thru 677_8. The Preset Value of Counters may be placed in addresses 500_8 thru 577_8 and from 700_8 thru 777_8.

When the 1024 Data Table is selected, the Accumulated Values of Counter Instructions may also be placed in the same addresses as with the 256 and 512 Data Tables; additionally, the following addresses may be used:

- 1000_8 thru 1077_8
- 1200_8 thru 1277_8
- 1400_8 thru 1477_8
- 1600_8 thru 1677_8

Preset Values for these same Instructions are addressed exactly 100_8 higher for each corresponding address. (Refer to Figure 3).

Note that the use of the 1024 Data Table requires the use of four digits even though the address may seem to call only for three. For example, [CTU] [0] [2] [5] [0] requires a "leading zero" before 250.

Refer also to the Processor No. 1 Paragraph earlier in this Publication for information on methods of direct and indirect programming of other PLC Instructions.

HARDWARE

Modes of Operation – All PLC Processors, regardless of Catalog Numbers, have basic modes of operation as selected by the Mode Select Switch:

- PROGRAM LOAD, the mode for loading a program; outputs are disabled.
- TEST-MONITOR, the mode for program examination; outputs are disabled, but Processor scans the memory in the normal manner.
- RUN-MONITOR, the mode for normal operation; all outputs may be enabled, unless the internal diagnostic checking or external malfunction conditions cause a shutdown.

There is a fourth position on Processor with enhanced Catalog Numbers. This additional position, RUN/PROGRAM LOAD, currently functions the same as the RUN-MONITOR position. (Future product developments may add other functions to the use of this position.) Refer to Figure 9.

Front Panel Description – The front panel of the Processor Chassis is divided into three control sections: STATUS, FAULT MONITOR, and an area for the Mode Select Switch. (Refer to Figure 9.) Each section is discussed in the following paragraphs:

STATUS – Processor status is displayed by four indicators in the STATUS section. Their functions are as follows:

- PROCESSOR RUN – A green indicator, it illuminates when the Processor is operating.
- MANUAL LOAD – A red indicator, this signals that the Mode Select Switch is in the PROGRAM LOAD position.
- OUTPUTS DISABLED – A red indicator, it illuminates when outputs are disabled.
- COMPUTER LOAD – This red status indicator illuminates when an optional Computer Interface Module is in place, and the Load function is switch selected on the Module in order to allow program loading, or modifica-

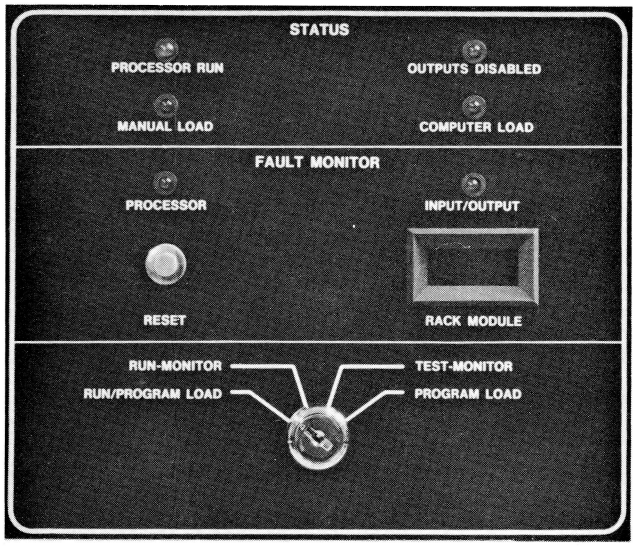

Figure 9 — Processor Control Panel

tion, by a user's computer when the Mode Select Switch is in the TEST-MONITOR position. It also illuminates when the Mode Select Switch is in the RUN-MONITOR position if the Load-in-Run function is also set on the Module.

FAULT MONITOR — Fault indications, resulting from continuously operating internal diagnostic functions, are displayed on the Control Panel. There are four elements in this section.

- PROCESSOR — When illuminated, this red indicator signals a fault condition within the PLC Processor. (Refer to the PLC Installation and Maintenance Manuals, for an explanation of the conditions that could cause this diagnostic indicator to illuminate.)
- RACK/MODULE — A two-digit numeric display which shows the I/O Rack and module slot numbers in the particular system where the fuse is blown or another fault has occurred.
- RESET — After a blown fuse is replaced, the Reset push button is to be pressed. Should there be an additional blown fuse, the I/O Rack and module address of the next blown fuse will be displayed in the Rack/Module window. (This push button also serves resetting functions in certain Remote I/O PLC systems.)
- INPUT/OUTPUT — When illuminated, this red indicator signals faulty communication to the Processor through the I/O Scanner Module.

Mode Select Switch — Processor operating modes are selected by means of a four-position keylock switch that occupies the third section of the Control Panel. The four modes are detailed earlier in this Publication at Modes of Operation.

DIAGNOSTIC INDICATORS

Diagnostic checks are continuously performed by the Processor for many critical internal functions. When one of these diagnostic checks detects a malfunction, an indicator illuminates. The following paragraphs give the name and functions of many of these indicators.

Processor Module No. 1 — There are 5 diagnostic indicators on the front edge of the Processor Module No. 1. (Refer to Figure 10.) They are explained here in the order in which they appear on the module (from top to bottom).

- CLOCK FAILED — When illuminated, this diagnostic indicator signals the loss of the memory clock.

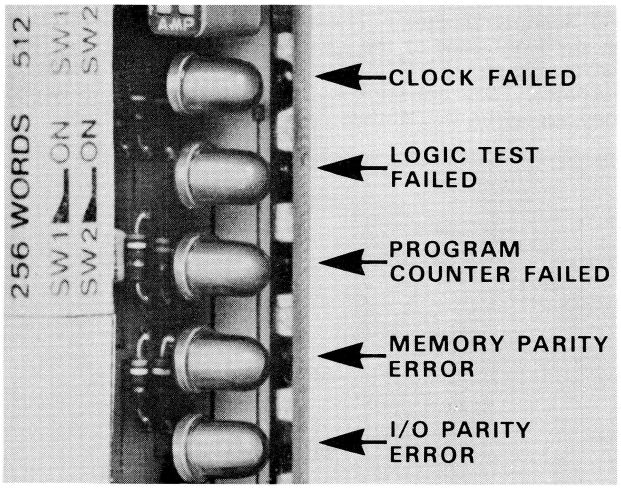

Figure 10 — Diagnostic Indicators, Processor Module No. 1

- LOGIC TEST FAILED — The test is used to detect a failure in the decoding section of the logic, as is shown when the indicator illuminates. A fixed program on this Module checks for normal operation and program sequencing. This self-checking diagnostic program is executed once each memory scan.
- PROGRAM COUNTER FAILED — When lit, this indicator signals that the PLC has stopped its sequential scanning of memory.
- MEMORY PARITY ERROR — This indicator illuminates to show that data read from memory was not in the proper form. When this error occurs, the memory must be reloaded. (Refer to the troubleshooting section of the Remote I/O Installation and Maintenance Manuals for details in locating this type of error.)
- I/O PARITY ERROR — This indicator illuminates to indicate that data coming from the I/O Rack is not in the proper form. (Refer to Installation and Maintenance Manuals for additional information concerning this indicator.)

Processor Module No. 2 — There is a single diagnostic indicator on the front edge of this Module. It is a 1-second ON, 1-second OFF indication. Continued blinking indicates normal system clock operation. (Refer to Figure 11.)

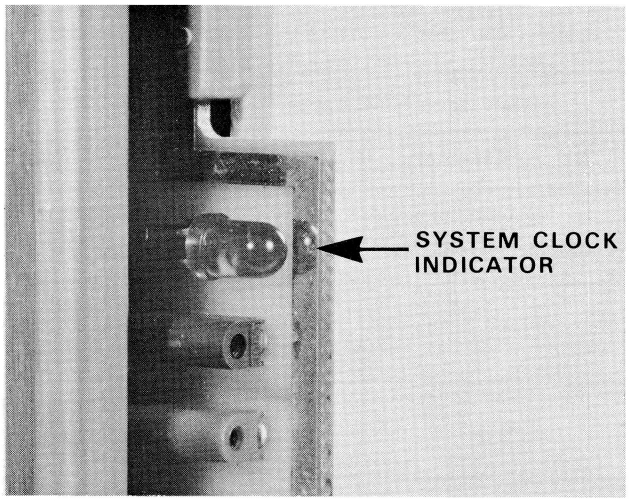

Figure 11 — System Clock Indicator, Processor Module No. 2

I/O Scanner Module – There are 2 diagnostic indicators on the front edge of the Local I/O Scanner Module. (Refer to Figure 12.) Both are helpful for troubleshooting purposes. They are explained here in the order in which they appear on the Module (from top to bottom).

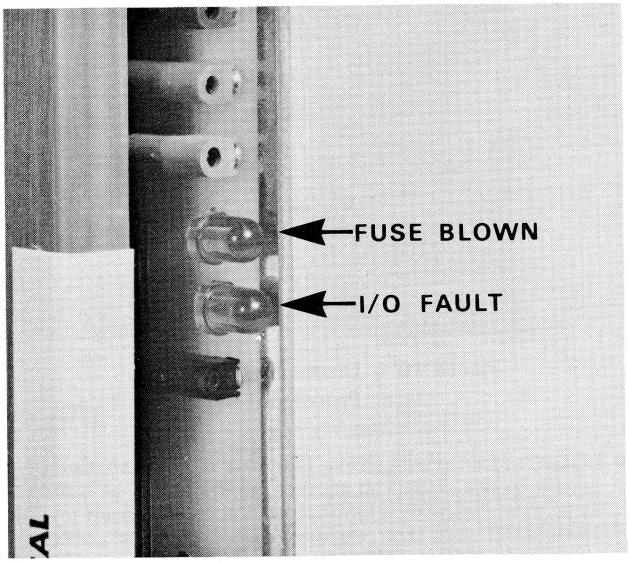

Figure 12 – Local I/O Scanner Module

- FUSE BLOWN – This is a "common" fault indicator, and may have many meanings. Presently it indicates that an output module fuse has blown, an I/O Rack has lost power, or an I/O power cable is disconnected or loose. (More functions may be developed.)
- I/O FAULT – When this diagnostic indicator illuminates, an I/O fault has occurred. The signal could indicate that the Processor failed to recognize data from the input/output system. It could also mean that the I/O Adapter Module (Cat. No. 1774-AL) is not transferring data properly.

Diagnostic function indicators for the combination of the Remote I/O Half-Scanner Module and the Remote I/O Distribution Panel are included on the front of the Distribution Panel. (Refer to the Remote I/O PLC Installation and Maintenance Manual for information concerning these diagnostic indicators.)

COMPATIBILITY

Processor modules, regardless of series level, with Catalog Numbers suffixed with the digit 2 (such as Cat. No. 1774-TB2) operate in all Processor Chassis with earlier Catalog Numbers. However, when these modules are used in Processors having Catalog Numbers 1774-LP1, -LP2, -RP1, -RP2, operational capability of these modules is the same as what it would be if superseded modules (without the suffix 2) were being used.

CAUTION: Modules with superseded Catalog Numbers (that is, without the suffix 2) should **never** be placed in enhanced Processors having Cat. No. 1774-LP3, -RP3, or -RP4. Keying bands on backplane sockets are installed to guard against this practice.

Sockets on Processor Chassis (Cat. No. 1774-LA2) backplanes are keyed to guard against mistakenly inserting a module in the wrong slot. New keying positions for the current modules guard against inserting modules with superseded Catalog Numbers in the current Processor.

This is a **general** discussion on Processor compatibility. Specific details concerning module compatibility can be found in individual product data sheets.

Note that the Memory Module (Cat. No. 1774-MA) and the I/O Scanner Modules, Local and Remote (Cat. No. 1774-SL and -SR), remain unchanged, and, therefore, they may be used in all Processors without capability restraints, although slot assignments in differing Processors should be observed.

Note: The material presented in this Publication, although fixed at the time of publication, is subject to change without notice. Allen-Bradley assumes no responsibility for the effects such changes have on this product or its application in a given installation.

Table C
PLC INSTRUCTION EXECUTION TIMES

TIME		INSTRUCTION
8K, 12K memory	4K memory	
1 μs	2 μs	⊤ ⊣ + − × ÷
2 μs	4 μs	⊣⊢ ⊣/⊢ GET PUT LES EQU CTR RTR
3 μs	6 μs	○ ⊘ (L) (U)
4 μs	8 μs	TON TOF RTO CTU CTD

NOTES

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